

REMARKS

Claims 1-30 are currently pending in the subject application, and are presently under consideration. Of claims 1-30, claims 9-15 have been withdrawn from consideration. Claims 1-8 and 19-30 stand rejected. Claims 1, 19, and 22 have been amended. Claims 2 and 20 have been cancelled. Favorable reconsideration of the application is requested in view of the amendments and comments herein.

I. Rejection of Claims 1-3, 6-8, 19, and 21-30 Under 35 U.S.C. §102(e)

Claims 1-3, 6-8, 19, and 21-30 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,493,790 to Khieu, et al. ("Khieu"). Claims 1 and 19 have been amended. Claim 2 has been cancelled. Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claim 1 has been amended to substantially include the claim element of cancelled claim 2. Specifically, amended claim 1 recites that the plurality of CAM fields comprises a first field and a second field, the first field being associated with a physical address and the second field being associated with a virtual address. The Office Action dated February 28, 2006 (hereinafter "Office Action"), asserts that Khieu anticipates cancelled claim 2 by stating that, "since the fields of the CAM are virtual addresses and are being translated into physical addresses, the first field and the second field are associated with both virtual and physical addresses," (Office Action, pages 4-5; citing Khieu, col. 1, ll. 21-24). Representative for Applicant respectfully disagrees, and further respectfully submits that this assertion fails to appreciate the difference between a virtual address and a physical address.

As is known in the art, a virtual address contains location information of physical memory (*i.e.*, physical addresses) in which data is stored, such that a computer can operate in a much larger memory environment than it actually has (see, *e.g.*, http://en.wikipedia.org/wiki/Virtual_memory). Translation of virtual memory to physical memory is a fundamental component of addressing using virtual memory (*Id.*). Khieu describes the process of virtual to physical address translation:

Translation of virtual addresses to physical addresses is performed by an operating system running on general purpose computer using page tables stored in primary memory or secondary memory. The page tables contain a set of page table translation entries, each of which maps a virtual address to a corresponding physical address. Each page table translation entry contains a virtual page number associated with the virtual address and a physical page number associated with the physical address corresponding to the virtual address. The operating system accesses the page tables whenever a virtual-to-physical address translation is required. (Khieu, col. 1, ll. 38-49).

Khieu teaches a CAM that stores virtual addresses (Khieu, col. 4, ll. 2-4 and ll. 23-30).

However, Khieu also teaches a RAM that stores physical addresses that correspond to the virtual addresses stored in the CAM (Khieu, col. 4, line 46 through col. 5, line 6), a teaching that is acknowledged by the Examiner in the rejection of claim 20 (Office Action, page 9).

Specifically, a given virtual address in the CAM gets translated into a physical address stored in the RAM (Khieu, col. 4, ll. 58-61 and col. 5, ll. 2-6). Khieu does not teach that physical addresses are stored in the CAM, and therefore does not teach that the first field is associated with a physical address and the second field is associated with a virtual address, as recited in amended claim 1.

Furthermore, it is respectfully submitted that, by reciting that the first field is associated with a physical address and the second field is associated with a virtual address, claim 1 recites a meaningful distinction between associations of the first field and the second field of the CAM entry. The Examiner's assertion that "since the fields of the CAM are virtual addresses and are being translated into physical addresses, the first field and the second field are associated with both virtual and physical addresses" fails to appreciate the meaningful distinction presented in the language of amended claim 1. In other words, as interpreted by the Examiner, if all virtual addresses are associated with a physical address by virtue of translation, the claim element "the second field being associated with a virtual address" would have no distinct meaning. Therefore, based on the language of amended claim 1, the first field and the second field cannot be associated with both virtual and physical addresses, as asserted by the Office Action.

For all of the reasons described above, Khieu does not anticipate amended claim 1. Withdrawal of the rejection of claim 1, as well as claims 3-8, 25, and 26 which depend therefrom, is respectfully requested.

Claim 3 recites that at least one of the first field and the second field is interleaved with at least one other of the plurality of CAM fields. Claim 3 depends from claim 1, and for at least the reasons described above regarding claim 1, claim 3 should also be allowed over the cited art. In addition, the Office Action asserts that, "[s]ince the first field is a subsection of the second field, these fields are interleaved with each other," (Office Action, page 5). Representative for Applicant respectfully disagrees, and further respectfully submits that there is no basis for the assertion "the first field is a subsection of the second field." Such a statement is not claimed in the Present Application, nor does it appear in the Specification of the Present Application. Claim 1 recites at least one CAM entry comprising a plurality of CAM fields, the plurality of CAM fields comprising a first field and a second field. Therefore, the first field and the second field are a subset of the plurality of CAM fields. However, there is no indication in the language of claim 1, or claim 3 which depends therefrom, that "the first field is a subsection of the second field," as asserted in the Office Action.

In addition, as stated above, Khieu teaches that "[e]ach CAM cell group corresponds to a portion of [a] CAM cell row that may be selectively included or excluded from comparison," (Khieu, col. 5, ll. 53-56). Representative for Applicant respectfully submits that Khieu does not teach a first field that is a subsection of a second field of a CAM cell group. In the rejection of claim 1, the Office Action states that "the first field excludes a portion of CAM cell row from comparison; while the second field includes the portion of CAM cell row for comparison," (Office Action, pages 3-4; citing Khieu, col. 5, ll. 52-56). Thus, the Office Action interprets Khieu as teaching that the first field is the portion of the CAM cell row that is excluded from comparison, while the second field is the portion of the CAM cell row that is included for comparison. However, this interpretation of the teachings of Khieu also fails to indicate that the first field is a subsection of the second field, as asserted in the Office Action.

Further to the above discussion of claim 3, even assuming *arguendo* that Khieu teaches a first field that is a subsection of a second field, Representative for Applicant respectfully submits that there is no correlation between interleave, as it is used in the Present Application, and one item being a subsection of another. Interleave is defined as "intersperse alternately," (see, *e.g.*, <http://dictionary.reference.com/search?q=interleave>). Such definition is consistent with the use of "interleave" in the Specification of the Present Application:

It will be appreciated that the association of the various data storage units with the plurality of data fields does not imply a corresponding physical ordering in a given memory entry. For example, if a plurality of data storage units (*e.g.*, 61, 63, 66, and 67) are associated with a first data field, the associated data storage units can be ordered within the entry (*e.g.*, 60) as to be interleaved with data storage units associated with one or more other fields (*e.g.*, 62, 64, 65, 68, and 69). (Present Application, FIG. 2; page 4, ll. 11-16).

There is no indication in the language of the Present Application that the first data field is a subsection of the second data field, despite being interleaved with each other, or that the interleaving of the first data field with one or more other data fields is as a result of being a subsection of the one or more other data fields. Thus, "subsection," as it is used in the Office Action assertion, and "interleaved," as it is used in the Present Application, are unrelated terms. Therefore, Khieu does not teach that at least one of the first field and the second field is interleaved with at least one other of the plurality of CAM fields, as recited in claim 3. Accordingly, for all of the reasons stated above, Khieu does not anticipate claim 3. Withdrawal of the rejection of claim 3 is respectfully requested.

Claim 19 has been amended to substantially include the claim elements of cancelled claim 20. Specifically, amended claim 19 recites selecting a first CAM field from a memory entry in a first mode and a second CAM field from the memory entry in a second mode, the first CAM field comprising one of a virtual address and a physical address and the second CAM field comprising the other of the virtual address and the physical address. In the rejection of cancelled claim 20, the Office Action relies on U.S. Patent No. 5,383,146 to Threewitt ("Threewitt") by

stating that "Threewitt discloses a CAM functioning as a RAM," (Office Action, page 9; citing Threewitt, col. 6, ll. 20-23). Representative for Applicant respectfully submits that the combination of Khieu and Threewitt does not teach or suggest amended claim 19.

As described above, Khieu teaches that virtual addresses are stored in a CAM and corresponding physical addresses are stored in a RAM (Khieu, col. 4, ll. 2-4, ll. 23-30, and line 46 through col. 5, line 6). Khieu further teaches that "[e]ach CAM cell group corresponds to a portion of [a] CAM cell row that may be selectively included or excluded from comparison," (Khieu, col. 5, ll. 53-56). The teachings of Khieu are therefore focused on the selective comparison of virtual addresses stored in a CAM. Threewitt teaches that comparators in one or more columns of CAM cells are disabled, such that the comparator no longer participates in the comparison with the search word, such that the column of the CAM cells functions as a RAM, rather than a CAM (Threewitt, col. 5, ll. 6-15). Accordingly, Threewitt teaches that a cell behaves as either a RAM or a CAM, but not both. The Office Action asserts that "the physical addresses of Khieu's RAM can be stored in a CAM field," (Office Action, page 9). However, as described above, Threewitt teaches that a CAM cell that is converted to a RAM cell does not participate in the comparison with the search word. Thus, according to Threewitt, a converted RAM no longer functions as a CAM. Therefore, Representative for Applicant respectfully submits that there is no motivation to combine the teachings of Khieu with the teachings of Threewitt to achieve the invention of amended claim 19. Accordingly, neither Khieu nor Threewitt, individually or in combination, teach or suggest amended claim 19. Withdrawal of the rejection of claim 19, as well as claims 21 and 28-30 which depend therefrom, is respectfully requested.

Claim 22 recites means for selectively enabling access to a stored physical address associated with a first CAM field if a physical address mode is selected and a stored virtual address associated with a second CAM field if a virtual address mode is selected. For at least the reasons described above regarding amended claim 1, Khieu does not anticipate claim 22. Furthermore, the Office Action "interprets the physical address mode to be the mode excluding the portion of CAM cell row and the virtual address mode to be the mode including the portion

of CAM cell row," (Office Action, page 7; citing Khieu, col. 5, ll. 53-55). Representative for Applicant respectfully submits, for substantially the reasons stated above with regard to amended claim 1, that virtual addressing and physical addressing are both separate and distinct concepts from inclusion and exclusion of CAM cells for comparison. Therefore, claim 22 should also be allowed over the cited art. Withdrawal of the rejection of claim 22, as well as claims 23 and 24 which depend therefrom, is respectfully requested.

Claim 26 recites that the CAM entry comprises a plurality of storage units, at least one of the plurality of storage units being associated with both the first field and the second field. Claim 26 depends from claim 1, and for at least the reasons described above regarding claim 1, claim 26 should also be allowed over the cited art. In addition, the Office Action asserts that claim 26 is taught by Khieu with reference to FIG. 4, reference number 45. Representative for Applicant respectfully disagrees. As discussed above, in the rejection of claim 1, the Office Action states that "the first field excludes a portion of CAM cell row from comparison; while the second field includes the portion of CAM cell row for comparison," (Office Action, pages 3-4; citing Khieu, col. 5, ll. 52-56). The interpretation of "first field" and "second field", as proffered by the Office Action, dictates that the first field and the second field are mutually exclusive fields because a portion of a CAM row cannot be both included for and excluded from comparison simultaneously. Therefore, as interpreted by the Office Action, Khieu does not teach that the CAM entry comprises a plurality of storage units, at least one of the plurality of storage units being associated with both the first field and the second field, as recited in claim 26. Withdrawal of the rejection of claim 26 is respectfully requested.

Claim 27 recites that the CAM system being a translation look-aside buffer. Claim 27 depends from allowed claim 16, thus rendering claim 27 as allowable. Withdrawal of the rejection of claim 27 is respectfully requested.

Claim 29 recites further comprising interleaving the first CAM field in the memory entry with the second CAM field in the memory entry. Claim 29 depends from claim 19, and for at least the reasons described above regarding claim 19, claim 26 should also be allowed over the cited art. In addition, the Office Action asserts that claim 29 is rejected for similar reasons as

claim 8. Claim 8 recites a processor assembly comprising the memory cache system of claim 7. Representative for Applicant assumes that the Office Action intended to state that claim 29 is rejected for similar reasons as claim 3, and thus, for the reasons described above regarding claim 3, Khieu does not anticipate claim 29. Withdrawal of the rejection of claim 29 is respectfully requested.

Claim 30 recites that each memory entry comprises a plurality of storage units, at least one of the plurality of storage units being associated with both the first CAM field and the second CAM field. Claim 30 depends from claim 19, and for at least the reasons described above regarding claim 19, claim 30 should also be allowed over the cited art. In addition, for the reasons described above regarding claim 26, Khieu does not anticipate claim 30. Withdrawal of the rejection of claim 30 is respectfully requested.

For the reasons described above, claims 1, 3, 6-8, 19, and 21-30 should be patentable over the cited art. Accordingly, withdrawal of this rejection is respectfully requested.

II. Rejection of Claim 20 Under 35 U.S.C. §103(a)

Claim 20 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Khieu in view of Threewitt. Claim 20 has been cancelled, and the subject matter of claim 20 has been incorporated into amended claim 19. Claim 19 has been addressed in Section I. above, thus rendering this rejection moot.

III. Rejection of Claims 4 and 5 Under 35 U.S.C. §103(a)

Claims 4 and 5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Khieu. Withdrawal of this rejection is respectfully requested for at least the following reasons.

Claims 4 and 5 recite that the match evaluator comprises at least one pull-down field effect transistor, and the at least one input selector comprises at least one multiplexer, respectively. Claims 4 and 5 depend from claim 1. As described above, Khieu does not teach that the plurality of CAM fields comprises a first field and a second field, the first field being associated with a physical address and the second field being associated with a virtual address, as

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recited in amended claim 1. Therefore, Khieu does not teach or suggest claims 4 and 5, which depend from claim 1. Withdrawal of the rejection of claims 4 and 5 is respectfully requested.


CONCLUSION

In view of the foregoing remarks, Applicant respectfully submits that the present application is in condition for allowance. Applicant respectfully requests reconsideration of this application and that the application be passed to issue.

Should the Examiner have any questions concerning this paper, the Examiner is invited and encouraged to contact Applicant's undersigned attorney at (216) 621-2234, Ext. 106.

No additional fees should be due for this response. In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to Deposit Account No. 08-2025.

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